

NOAA Climate Test Bed (CTB)

Advancing NOAA's Operational Subseasonal to Seasonal Prediction Capability

NOAA's operational prediction efforts are a core part of NOAA's mission to support economic vitality and protect American lives and resources. As part of NOAA's research Line Office, OAR, the Office of Weather and Air Quality (OWAQ) supports world-class weather and air quality research to save lives, reduce property damage, and enhance the national economy. OWAQ works closely with the National Weather Service (NWS) to help develop and transition weather and air quality research, including hurricanes, severe thunderstorms, heavy precipitation, and air pollution while enhancing two-way collaboration, coordination, and feedback between operations and research to accelerate the pace of capability improvements. OWAQ supports research to improve the NWS National Centers for Environmental Prediction (NCEP) Climate Prediction Center (CPC) operational products through an NCEP partnership supporting the Climate Test Bed (CTB). CTB projects are intended to test and demonstrate the potential for scientific advances from the external research community to improve operational climate predictions, and to enhance the public benefits derived from these research activities. The CPC delivers real-time products and information that predict and describe climate variations on timescales from weeks to years thereby promoting effective management of climate risk and a climate-resilient society. The fundamental mission of the NCEP/NWS Environmental Modeling Center (EMC), in close collaboration with our partners and stakeholders, is to maintain, enhance and transition-to-operations advanced numerical guidance systems for the Nation's weather/water/climate enterprise and the global community for the protection of life/property and the enhancement of the economy.

In Fiscal Year (FY) 2020, OWAQ, in partnership with the CPC and the Environmental Modeling Center (EMC), is soliciting proposals involving the external community to advance the NOAA's subseasonal to seasonal prediction (S2S) capabilities with a preference toward activities that enhance precipitation outlooks via the CTB. The CTB supports advanced projects seeking to transition to operations where testbed interactions and demonstrations in a quasi-operational environment are key aspects. Research projects should focus on:

1. Model post-processing via innovative statistical techniques and applications of existing statistical techniques, including Artificial Intelligence (AI)/Machine Learning (ML) methods. Techniques should be applicable to existing operational NOAA numerical models and ensemble modeling suites, such as those included in North American Multi-Model Ensemble (NMME) and NOAA Subseasonal Experiment (SubX). Ideal projects will support concepts such as multi-model combinations, extraction of information above currently employed methods, and potentially inform future ensembling strategies by informing optimization strategies.
2. Developmental activities to accelerate the S2S portion of the Unified Forecast System (UFS), with specifics in the Strategic Implementation Plan¹ Emphasis areas. Project concepts can include new methods or improvements to existing scale- and aerosol aware parameterizations using the Common Community Physics Package (CCPP), physically based marine component stochastic perturbations for UFS S2S ensemble applications, mathematical methods for process level diagnostics and verifications as related to

¹ https://www.weather.gov/media/sti/nggps/UFS%20SIP%20FY19-21_20181129.pdf

climate-scale modes of variability (such as Madden-Julian Oscillation, North Atlantic Oscillation, Quasi-Biennial Oscillation, El Nino-Southern Oscillation, etc.), improvements to UFS model components².

3. Enhancements to data assimilation systems that support climate monitoring and prediction, specifically related to ocean, sea ice, and land data assimilation using the Joint Effort for Data-Assimilation Integration (JEDI)³. Enhancements to current data assimilation (DA) systems toward a more strongly coupled DA system may also be considered, depending on the readiness level. Additionally, enhancements to methods used to create long-term reanalyses, or enhancements to existing reanalysis datasets, that improve current climate monitoring products, including drought monitoring.

Within each research area, proposals may elect to focus on specific aspects listed above. Projects should demonstrate relevance to strategic programmatic and agency directions^{4,5}. Projects that are relatively mature and not in the early or middle stages of development or proof-of-concept are appropriate for these testbeds and this funding opportunity. Proposed work will ideally lead to capabilities that will improve operational or experimental prediction systems, techniques, or products. Research that will transition to operations in the next 3-5 years can also be included in the proposed work.

Projects that are most appropriate for the testbed generally fall in or near the “demonstration” level of technical maturity, i.e., Readiness Levels (RLs) of about 5 through 8 during the duration of the project. Given this expectation, projects selected for funding from this announcement should be ready or nearly ready to test and demonstrate their new capabilities during the project period. Proposed ideas that begin at RL 7, with high potential to demonstrate transition to operations (RL 8) at the commencement of 2 year funding period will be favored. Proposals should provide discussion on what the project will achieve upon successful operational implementation. Transitioning a mature demonstrated capability from RL 8 to 9 is beyond the scope of the testbeds and this funding opportunity but could occur after the projects end if they are successful and approved for operational implementation. Projects that are projected to end at or below RL 7 may still apply; however, they must consider obtaining additional funding sources at the end of the two-year CTB funding period.

A transition plan signed by the NWS and OAR Assistant Administrators, or their designees, must be submitted with the proposal. Please see NOAA Administrative Order NAO 216-105B⁶ (section 3.06) and the accompanying procedural handbook⁷ (Chapter 2, section D) for information on preparing a transition plan. Proposals must comply with all requirements for Climate Test Bed proposals (see the Notice of Funding Opportunity) by demonstrating relevant research with a goal of improving operational prediction or tools that can transition to operations, including an NCEP co-PI or collaborator on the proposal, having explicit support from NCEP to access required data and models, and using NCEP’s metrics for evaluation⁸. The proposal should thus identify where and how the research could transition to operations, resources required for long-term maintenance (if applicable), and discussion of viability and compatibility with NOAA

² <https://ufscommunity.org/#/science/aboutapps>

³ <https://www.jcsda.org/jcsda-project-jedi>

⁴ https://www.weather.gov/media/wrn/NWS_Weather-Ready-Nation_Strategic_Plan_2019-2022.pdf

⁵ <https://owaq.noaa.gov/Strategic-Plan>

⁶ https://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/NAO%20216-105B%20UNSEC%20Signed.pdf

⁷ https://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/Handbook_NAO216-105B_03-21-17.pdf

⁸ https://www.cpc.ncep.noaa.gov/products/ctb/meetings/2013/Metrics_climate_models&fcst_26July.pdf

IT and operational requirements.

Performance progress will be monitored throughout the project by the testbed staff and OWAQ through communications and periodic progress reports by the PIs. At the end of the project (within 90 days from the conclusion), an NCEP-OWAQ review will assess the feasibility of a transition of the project into operations. Therefore, the transition plan must include an indication that NCEP will support the NCEP co-investigator(s) to implement the new methodologies during the year following the project review, with operational implementation conditional on the review outcomes and at the discretion of NCEP. Completed projects satisfying NCEP's metrics for evaluation and operational constraints (e.g., added value, ease of use, computational efficiency, etc.) may be selected later for operational implementation by appropriate NCEP operational offices.

Proposals are encouraged to include support for a team member to work at NCEP as a visiting scientist. Projects with this component must include in their proposal a timeline for the visit, the investigator role in the project, specification of an NCEP sponsoring staff member, a request for adequate travel resources, and a description of the resources needed by the visitor along with a guarantee of provision by NCEP.

Proposals may be for a period of two years with a funding level of up to \$250k/yr.

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